April 15 version

HATT Test 1 Practice Name: Solutions Per E Seat:

1. (2 points) Solve the equation:

$$7(x+5) = 7[x-(2-x)]$$

$7x+35 = 7[x-2+x]$

$7x+35 = 14x-14$

$35+14 = 7x$

$x = 5+2 = 7$

Check $7(12) \overset{?}{=} 7(7-(-5))$ ✓

2. (2 points) Solve the equation:

$$\frac{2x}{x^2-16} = \frac{2}{x^2-16} - \frac{1}{(x+4)}\frac{(x-4)}{(x-4)}$$

$\frac{2x}{x^2-16} = \frac{2-(x-4)}{x^2-16}$

$2x = 2-x+4$

$3x = 6$

$x = 2$

3. (2 points) Solve for h:

$$S = 2\pi rh + 2\pi r^2$$

$S = 2\pi r(h+r)$

$h+r = \frac{S}{2\pi r}$

$h = \frac{S}{2\pi r} - r$

4. (2 points) Solve for P:

$$P - \frac{7Q}{3} = \frac{P+5}{2} + 1$$

$6P - 14Q = 3P + 15 + 6$

$3P = 21 + 14Q$

$P = 7 + \frac{14Q}{3}$

5. (2 points) It costs \$45 per hour plus a flat fee of \$25 for a plumber to make a house call. After writing an equation for this situation, what is the total cost to have a plumber come to a house for 10 hours?

$C(h) = 25 + 45h$

or $y = 25 + 45x$

6. (2 points) Solve for by factoring:

$$12x^2 - 5x - 25 = 0$$

$(3x-5)(4x+5) = 0$

$x = \frac{5}{3}$ or $\frac{-5}{4}$

$x^2 + bx + \frac{b^2}{2^2} = \left(x+\frac{b}{2}\right)^2$

7. (2 points) What number should be added to complete the square of the expression:

$$x^2 + \frac{1}{h}x = 3$$

add $\left(\frac{1}{2}\cdot\frac{1}{h}\right)^2 = \left(\frac{1}{2h}\right)^2 = \frac{1}{4h^2}$ to both.

So $x^2 + \frac{1}{h}x + \left(\frac{1}{4h^2}\right) = 3 + \left(\frac{1}{4h^2}\right)$

$\left(x+\frac{1}{2h}\right)^2 = \frac{12h^2+1}{4h^2}$

$x = \frac{-1}{2h} \pm \frac{\sqrt{12h^2+1}}{2h}$

8. (2 points) Solve by completing the square:

$$\frac{1}{4}x^2 + \frac{1}{16}x - \frac{1}{8} = 0$$

$$4\left(\frac{1}{4}x^2 + \frac{1}{16}x - \frac{1}{8}\right) = 4(0)$$

$$x^2 + \frac{1}{4}x - \frac{1}{2} = 0$$

$$x^2 + \frac{1}{4}x + \left(\frac{1}{8}\right)^2 = \frac{1}{2} + \left(\frac{1}{8}\right)^2$$

$$x^2 + \frac{1}{4}x + \frac{1}{64} = \frac{1}{2} + \frac{1}{64}$$

$$\left(x + \frac{1}{8}\right)^2 = \frac{33}{64}$$

$$x = -\frac{1}{8} \pm \frac{\sqrt{33}}{8}$$

9. (2 points) Find the real solutions, if any, of the equation

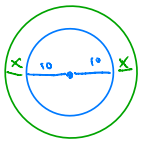
$$9x = 14x^2$$

$$14x^4 - 9x = 0$$

$$x(14x - 9) = 0$$

$$x = 0 \text{ or } \frac{9}{14}$$

10. (5 points) A circular pool measures 20 feet across. Two cubic yards of concrete is to be used to create a circular border of uniform width around the pool. If the border is to have a depth of 3 inches, how wide will the border be? (1 cubic yard = 27 cubic feet)



x = border width

$$C = (10+x)^2\pi - 10^2\pi$$

$$\frac{20}{\pi} = 100 + 20x + x^2 - 100$$

$$=$$

11. (2 points) Write the expression in the standard form $a + bi$.

$$\frac{5}{7+i}\cdot\frac{(7-i)}{(7-i)} = \frac{35-5i}{49-i^2}$$

$$= \frac{35-5i}{50}$$

$$= \frac{7}{10} - \frac{1}{10}i$$

12. (2 points) Write the expression in the standard form $a + bi$.

$$i^{17} = (i^{16})(i)$$

$$= (1)(i)$$

$$= i$$

$$(\text{or } 0 + 1i)$$

13. (2 points) Find the real solutions of the equation

$$3(x+1)^2 + 5(x+1) + 2 = 0$$

Let $u = x+1$

$$3u^2 + 5u + 2 = 0$$

$$(u+1)(3u+2) = 0$$

$$u = -1 \text{ or } -\frac{2}{3}$$

so

$$x+1 = -1 \quad \text{or} \quad x+1 = -\frac{2}{3}$$

$$x = -2 \quad \text{or} \quad x = -\frac{5}{3}$$

14. (2 points) if $x < 8$, then

(a) $-3x \leq -24$

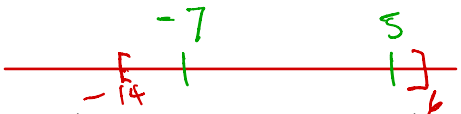
(b) $-3x < -24$

(c) $-3x > -24$

(d) $-3x \geq -24$

$$-3(x) < (8)(-3)$$

$$-3x > -24$$



15. (2 points) Which are the the interval(s) where

$$|x+1|+7 \le 13$$

(a) $[-7, 5]$
(b) $[7, 13]$
(c) $(-7, 5)$
(d) $(7, 13)$
(e) $(-\infty, -7) \cup (5, \infty)$
(f) $(-\infty, -7] \cup [5, \infty)$
(g) $(-\infty, -7) \cup (13, \infty)$
(h) $(-\infty, -7] \cup [13, \infty)$

$-13 \le x+1 \le 7$

$-14 \le x \le 6$

$[-14, 6]$

16. (2 points) Translate the sentence "Momentum is the product of the mass of an object and its velocity" into a mathematical equation. Use M for momentum, m for mass, and v for velocity.

$M = mv$

17. (5 points) A chemist needs 80 milliliters of a 62% solution but has only 56% and 80% solutions available. Find how many milliliters of each that should be mixed to get the desired solution.

$x =$ ml of 56% solution

$y =$ ml of 80% solution

$x + y = 80$ ml

$.56x + .8y = .62(80)$

$y = 80 - x$

$.56x + .8(80-x) = .62(80)$

$-.24x + 64 = 49.6$

$x = \frac{49.6 - 64}{-.24}$

$x = 60$ ml

The chemist needs 60 ml of the 56% solution and 20 ml of the 80% solu

18. (5 points) Five friends drove at an average rate of 55 miles per hour to a weekend retreat. On the way home, they took the same route but averaged 70 miles per hour. What was the distance between home and the retreat if the round trip took 10 hours?

Rate going = 55 mph
Rate returning = 70 mph

x = hours going

$10 - x$ = hours returning

rate * time = distance
(same distance)

$$55x = 70(10-x)$$
$$55x = 700 - 70x$$
$$125x = 700$$
$$x = \frac{700}{125} = 5.6 \text{ hours}$$

$$d = r*t = 55(5.6) = 70(10-5.6) = 308$$

The retreat is 308 miles away

19. (5 points) Bruce can sew a precut dress in 3 hours. Helga can sew the same dress in 2 hours. If they work together, how long will it take them to complete sewing that dress? Give your answer in minutes (1 hour=60 minutes).

rate for Bruce = $\frac{1}{3}$ dress per hour

rate for Helga = $\frac{1}{2}$ dress per hour

x = time working together (in hours)

$$\frac{1}{3}x + \frac{1}{2}x = 1 \text{ dress}$$
$$2x + 3x = 6$$
$$5x = 6$$
$$x = \frac{6}{5} \text{ hour}$$
$$\frac{6}{5}(60 \text{ min}) = \frac{360}{5} = 72$$

It would take 72 minutes to make one dress working together.